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(54) **FIT-TOGETHER WALL BODY HAVING IMPROVED SOUND ABSORBING AND SCREENING
PERFORMANCE AND A FITTED-TOGETHER STRUCTURE COMPRISING THE SAME**

ZUSAMMENSETZBARER WANDKÖRPER MIT VERBESSERTER KLANGABSORPTIONS- UND
-SIEBUNGSLEISTUNG SOWIE ZUSAMMENGESETZTE STRUKTUR DAMIT

CORPS DE PAROI EMBOÎTABLE AYANT DES PERFORMANCES DE FILTRAGE ET
D'ABSORPTION DES SONS AMÉLIORÉES ET STRUCTURE EMBOÎTABLE LE COMPRENANT

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Description

[0001] The present invention relates to an assembly wall having improved sound absorption/insulation performance and an assembly structure thereof, and more particularly, to an assembly wall having improved sound absorption/insulation performance, in which micro-perforated holes of various sizes are formed on a web of a stud to provide a resonator-shaped shape, a functional sheet member having the micro-perforated holes adjoins an outer surface of an insulation member, thereby providing excellent sound absorption/insulation performance over various frequency bands including a low frequency band without increasing the thickness of the wall.

[0002] Unlike general walls, an assembly wall placed between a floor and the ceiling of a building such as multipurpose buildings, apartments, steel houses, etc., is designed not as a load bearing wall for bearing structural load of the building, but as a wall for effective use of a space.

[0003] Further, such an assembly wall generally includes stud and plate members.

[0004] In a general process of manufacturing an assembly wall, a track called a runner is adhered to the floor and the ceiling.

[0005] Then, studs are fastened to the runner to form a framework.

[0006] After construction of the framework, electricity and plumbing works are performed. Then, an insulation member is inserted into a space between the studs to provide thermal insulation and sound absorption functions to the assembly wall.

[0007] Finally, plate members, i.e. exterior members for the wall, are mounted on the studs to provide sound insulation and fireproofing functions to the assembly wall.

[0008] GB 2 283 256 A discloses a break-in-resistant partition wall comprising a pair of cladding boards facing one another and being separated by C-shaped profile vertical uprights, each including a bottom wall and a pair of side walls. An expanded metal mesh is disposed on the inside of the vertical uprights, while the cladding boards are fixed to the outside face of the side walls of the uprights. In one configuration, the wall may include an insulating mat.

[0009] Said Document GB 2 283 256 A discloses the features of the preamble of claim 1.

[0010] Conventionally, improved sound absorption/insulation performance of an assembly wall can be achieved only by a method of manufacturing an assembly wall using expensive sound insulation boards having excellent sound insulation performance, or a method of blocking sound waves by thickening the assembly wall.

[0011] However, both thickening of the assembly wall and use of the expensive sound insulation boards cause a significant increase in cost and is uneconomical and inefficient, thereby lowering competitiveness in production.

[0012] Therefore, there is an urgent need for an as-

sembly wall, which permits effective improvement in sound absorption/insulation performance without using expensive sound insulation boards or increasing the thickness of the wall.

[0013] According to the present invention, an assembly wall is provided as defined in claim 1 and an assembly structure is provided in claim 8. The assembly wall has an effective improvement in sound absorption/insulation performance by using inexpensive plate-shaped building materials without thickening the wall.

[0014] The assembly structure comprises the claimed assembly wall and a reinforced structure for supporting the assembly wall.

[0015] The present assembly wall includes: plate members separated from each other to face each other and each forming at least one layer; stud members alternately placed on different inner surfaces of the plate members and comprising a web formed with a plurality of first perforated holes having at least one diameter; an insulation member interposed in a space defined between the plate members and the stud members; and a sheet member adjoining an outer surface of the insulation member and being formed with a plurality of second perforated holes having at least one diameter.

[0016] The first perforated holes and the second perforated holes may have different diameters depending on a major sound absorption frequency.

[0017] The first perforated holes and the second perforated holes may have a diameter ranging from 0.1 mm to 5 mm.

[0018] The plate members may include a material having sound insulation and fireproof functions.

[0019] The plate members may include one material selected from among gypsum boards, magnesium oxide (MgO) boards, ceramic boards, cement boards, and lightweight concrete panels.

[0020] The insulation member may include a material having thermal insulation and sound absorption functions.

[0021] The insulation member may include one of rock wool, mineral wool, glass wool, ceramic fibers, polyethylene terephthalate (PET) nonwoven fibers, cellulose fibers, and various foaming materials.

[0022] Another configuration of an assembly wall, which is not part of the present invention, includes stud members placed on respective inner surfaces of the plate members to be arranged in double lines within a space between the plate members, each of the stud members comprising a web formed with a plurality of first perforated holes having at least one diameter; insulation members arranged in double lines along the arranged lines of the stud members; and sheet members adjoining outer surfaces of the insulation members and being formed with a plurality of second perforated holes having at least one diameter.

[0023] The assembly wall and the assembly structure according to the present invention may effectively enhance sound absorption/insulation performance using in-

expensive plate-shaped building materials without increasing the thickness of the assembly wall.

[0024] Namely, in the assembly wall and the assembly structure thereof having improved sound absorption/insulation performance according to the present invention, first perforated holes having various diameters (ranging from 0.1 mm to 5 mm) are formed on a web of a stud member to provide a resonator structure inside the assembly wall. Further, a functional sheet member adjoining an outer surface of an insulation member is formed with second perforated holes having fine diameters, thereby providing excellent sound absorption/insulation performance over various frequency bands including a low frequency band.

Description of Drawings

[0025]

Fig. 1 is a schematic perspective view of an assembly wall having improved sound absorption/insulation performance according to one exemplary embodiment of the present invention;

Fig. 2 is a cross-sectional view of the assembly wall of Fig. 1;

Fig. 3 is a perspective view of a stud member of the assembly wall of Fig. 1;

Fig. 4 is a schematic perspective view of another configuration of an assembly wall which is not part of the present invention; and

Fig. 5 is a cross-sectional view of the assembly wall of Fig. 4.

[0026] Description of Embodiments Exemplary embodiments of the present invention will now be described in more detail with reference to the accompanying Figures 1-3. The configuration in Figures 4 and 5 is not part of the present invention.

[0027] The above and other aspects and advantages of the present invention will become apparent from the detailed description of the following embodiments in conjunction with the accompanying drawings. It should be understood that the present invention is not limited to the following embodiments and may be embodied in different ways, and that the following embodiments are given to provide complete disclosure of the invention and to provide a thorough understanding of the present invention to those skilled in the art. The scope of the invention is defined only by the claims.

[0028] Fig. 1 is a schematic perspective view of an assembly wall having improved sound absorption/insulation performance according to one exemplary embodiment of the present invention, and Fig. 2 is a cross-sectional view of the assembly wall of Fig. 1. Figs. 1 and 2 are illustrated just for clear conceptual understanding of a relationship between the configurations of the present invention, and thus various alternatives may be expected without being limited to the certain shapes shown therein.

[0029] Referring to Figs. 1 and 2, an assembly wall 100 having improved sound absorption/insulation performance according to one exemplary embodiment includes plate members 110, stud members 120, an insulation member 130, and sheet members 140.

[0030] First, the plate member 110 will be described.

[0031] The plate member 110 refers to a plate-shaped building material forming an outer appearance of the assembly wall 100.

[0032] The plate members 110 are separated from each other to face each other. Each of the plate members 110 constitutes at least one layer.

[0033] In this embodiment, each of the plate members 110 includes a single additional layer 112 therein, as shown in Figs. 1 and 2, without being limited thereto.

[0034] As such, although the plate member 110 may include two or more additional layers 112 to enhance solidity and sound insulation performance of the assembly wall, the number of additional layers 112 may be suitably selected in consideration of thickness and cost.

[0035] Further, although the plate member 110 may be made of any material, it is advantageous that the plate member 110 be made of one material selected from among general gypsum boards, magnesium oxide (MgO) boards, ceramic boards, cement boards, and lightweight concrete panels, instead of expensive fireproof and sound insulation boards.

[0036] That is, since the assembly wall 100 according to the embodiment has improved sound absorption/insulation performance, it is possible to eliminate expensive fireproof and sound insulation boards for the plate member 110.

[0037] Next, the stud members 120 will be described.

[0038] As mentioned in the background, the stud member 120 is a building material fastened to a runner placed between a floor and the ceiling of a building to provide a framework of the assembly wall 100.

[0039] In this embodiment, the assembly wall 100 employs a stagger type stud as shown in Figs. 1 and 2. In another embodiment, an assembly wall 200 employs a double type stud, which will be described below with reference to Figs. 4 and 5.

[0040] The stud members 120 are alternately placed on different inner surfaces of the plate members 110.

[0041] Specifically, in a structure where the plate members 110 are arranged to face each other, when one stud member 120 is fastened to an inner surface of one plate member 110, the next stud member 120 is fastened to an inner surface of another plate member 110 to be separated a certain distance from the one stud member 120. That is, the stud members 120 are alternately placed on the inner surfaces of the facing plate members 110.

[0042] Here, the distance between the stud members 120 varies depending on the width, size and installation conditions of the assembly wall 110. It should be understood that these conditions do not limit the scope of the present invention.

[0043] Further, there is no limit as to the material of the

stud member 120. However, since the stud members 120 need to be rigid enough to bear horizontal and vertical loads applied to the assembly wall 100, the stud members 120 may be made of steel or any composite material having rigidity similar to that of the steel.

[0044] The structure of the stud member 120 will be described in more detail with reference to Fig. 3.

[0045] Fig. 3 is a perspective view of a stud member of the assembly wall of Fig. 1.

[0046] In Fig. 3, the stud member 120 is formed at opposite sides thereof with fastening holes 126 to be fastened to the plate member 110. Here, the stud member 120 may be fastened to the plate member 110 through the fastening holes 126 using various fastening means (for example, bolts), and thus a detailed description thereof will be omitted.

[0047] Further, a web 122 of the stud member 120 is formed with a plurality of first perforated holes 124a, 124b, 124c having various diameters.

[0048] The first perforated holes 124a, 124b, 124c are micro-perforated holes having small diameters.

[0049] The diameters of the first perforated holes 124a, 124b, 124c may vary depending on a major sound absorption frequency of the assembly wall 100 having improved sound absorption/insulation performance.

[0050] For example, the diameters of the first perforated holes 124a, 124b, 124c may vary in the range from 0.1 mm to 5mm.

[0051] According to the exemplary embodiment of Fig. 3, a first perforated hole indicated by reference numeral 124a has a diameter of 4 mm, a first perforated hole indicated by reference numeral 124b has a diameter of 0.9 mm, and a first perforated hole indicated by reference numeral 124c has a diameter of 3 mm.

[0052] The diameter range of the first perforated holes 124a, 124b, 124c may be suitably changed depending on overall design conditions of the assembly wall 100, such as the thickness, size, shape, material, etc. of the plate member 110, and the thickness, size, shape, material, etc. of the web of the stud member 120.

[0053] However, when the stud member 120 is manufactured so that the diameters of the first perforated holes 124a, 124b, 124c are much smaller than the lower limit of the diameter range (for example, 0.1 mm), it can be difficult to effectively absorb sound in a low frequency band. On the other hand, when the stud member 120 is manufactured so that the diameters of the first perforated holes 124a, 124b, 124c are much larger than the upper limit of the diameter range (for example, 5mm), it can be difficult to effectively absorb sound in a high frequency band.

[0054] The stud members 120 define a space (see R in Fig. 2), which is partitioned by the plate members 110 and the sheet member 140 described below in more detail. Such a space R (see Fig. 2) serves as a hollow space of a resonator, and provides high sound absorption performance in a low frequency band. Further, the diameters of the first perforated holes 124a, 124b, 124c are previ-

ously selected and arranged to provide high sound absorption performance in a high frequency band.

[0055] Next, the insulation member 130 will be described.

[0056] The insulation member 130 is a building material interposed in a space defined between the plate members 110 and the stud members 120, and has functions of thermal insulation and sound absorption.

[0057] The insulation member 130 is typically called a "core material," and generally employs rock wool. For example, the insulation member 130 may employ mineral wool, glass wool, polyethylene terephthalate (PET) non-woven fibers, ceramic fibers, cellulose fibers, various foaming materials, etc.

[0058] As shown in Fig. 1, the insulation member 130 according to the exemplary embodiment may be prepared using any of the foregoing materials and may have an air layer between the fibers to provide excellent thermal insulation and sound absorption functions. The insulation member 130 is interposed in a space defined between the stud members 120 placed on the inner surfaces of the plate members 110 within the space defined between the inner surfaces of the plate members 110.

[0059] Next, the sheet member 140 will be described.

[0060] The sheet member 140 is a thin sheet-shaped member to be placed on the outer surface of the insulation member 130. The wall assembly may include a single sheet member 140 placed on one side of the insulation member 130. Alternatively, the wall assembly may include two sheet members 140 placed on both sides of the insulation member 130, as shown in Fig. 1.

[0061] According to exemplary embodiments, the sheet member 140 is formed thereon with a plurality of second perforated holes having a constant diameter or various diameters.

[0062] Here, the second perforated holes 142 are micro-perforated holes having small diameters like the first perforated holes 124a, 124b, 124c as described together with the stud member 120.

[0063] Like the first perforated holes 124a, 124b, 124c, the diameter range of the second perforated hole 142 may vary depending on the major sound absorption frequency of the assembly wall 100 having improved sound absorption/insulation performance.

[0064] The diameter of the second perforated hole 142 may be determined in the range from 0.1 mm to 5 mm (for example, the second perforated hole 142 according to the exemplary embodiment shown in Fig. 1 has a diameter of 1 mm).

[0065] The sheet member 140 defines the space (see R in Fig. 2) partitioned by the plate members 110 and the stud members 120. As described above, the space R (see Fig. 2) serves as the hollow space of the resonator, and thus provides sound absorption high performance in a low frequency band.

[0066] Further, the sheet member 140 having the second perforated holes 142 has a function of panel type sound absorption as a unique effect due to its distinctive

shape. Therefore, the assembly wall 100 has significantly improved sound absorption performance causing high transmission loss.

[0067] Hence, the first perforated holes 124a, 124b, 124c of the stud member 120 and the second perforated holes 142 of the sheet member 140 designed to have proper diameters and arrangement improve sound absorption performance of the assembly wall 100 not only in a low frequency band but also in a preset major frequency band.

[0068] Next, a double stud type assembly wall 200 will be described with reference to Figs. 4 and 5, which is a comparative configuration and which is not part of the present invention.

[0069] Fig. 4 is a schematic perspective view of an assembly wall having improved sound absorption/insulation performance according to another exemplary embodiment and Fig. 5 is a cross-sectional view of the assembly wall of Fig. 4.

[0070] Referring to Figs. 4 and 5, the double stud type assembly wall 200 has substantially the same or similar construction and characteristics to those of the stagger stud type assembly wall 100 described with reference to Figs. 1 to 3. In Figs. 4 and 5, the difference between the assembly walls 100 and 200 is that stud members 220a, 220b are arranged in double lines and thus insulation members 230a, 230b are also arranged in double lines.

[0071] To avoid repeated descriptions of the components described with reference to Figs. 1 to 3, the assembly wall according to this embodiment will be described in terms of different features.

[0072] In this embodiment, the stud members 220a, 220b are arranged along two lines in a space between plate members 210. That is, the stud members 220a, 220b are individually placed along two lines on the inner surfaces of the plate members 210. Besides, the structure, shape and material of the stud members 220a, 220b are the same as those of the stagger stud type assembly wall 100 of Figs. 1 and 3.

[0073] Further, such arrangement of the stud members 220a, 220b allows the insulation members 230a, 230b to be arranged in two lines along the two lines of the stud members 220a, 220b.

[0074] Herein, some exemplary embodiments of the present invention have been described herein.

[0075] However, it should be understood by those skilled in the art that these embodiment are provided for illustrative purpose only and should not be construed in any way as limiting the present invention. Rather, it should be understood that various modifications, changes, alterations, and equivalent embodiments can be made without departing from the present invention, as defined only by the following claims.

Claims

1. An assembly wall (100) having improved sound ab-

sorption/insulation performance, comprising:

plate members (110) separated from each other to face each other and each forming at least one layer;

stud members (120) alternately placed on different inner surfaces of the plate members (110) and comprising a web (122) formed with a plurality of first perforated holes (124a, 124b, 124c) having at least one diameter;

an insulation member (130) interposed in a space defined between the plate members (110) and the stud members (120); and

a sheet member (140) adjoining an outer surface of the insulation member (130) and being formed with a plurality of second perforated holes (142) having at least one diameter,

characterized in that the first perforated holes (124a, 124b, 124c) of the web (122) have varying diameters depending on a major sound absorption frequency of the assembly wall and are exposed to an interior space (R) defined by the stud members (120), the plate members (110) and the sheet member (140).

2. The assembly wall of claim 1, wherein the first perforated holes (124a, 124b, 124c) and the second perforated holes (142) have different diameters depending on a selected major sound absorption frequency of the assembly wall (100).
3. The assembly wall of claim 2, wherein the first perforated holes (124a, 124b, 124c) and the second perforated holes (142) have a diameter ranging from 0.1 mm to 5 mm.
4. The assembly wall of claim 1, wherein the plate members (110) comprise a material having sound insulation and fireproof functions.
5. The assembly wall of claim 4, wherein the plate members (110) comprise one material selected from among gypsum boards, magnesium oxide (MgO) boards, ceramic boards, cement boards, and light-weight concrete panels.
6. The assembly wall of claim 1, wherein the insulation member (130) comprises a material having thermal insulation and sound absorption functions.
7. The assembly wall of claim 6, wherein the insulation member (130) comprises one of rock wool, mineral wool, glass wool, ceramic fibers, polyethylene terephthalate (PET) nonwoven fibers, cellulose fibers, and various foaming materials.
8. An assembly structure having improved sound absorption/insulation performance, comprising the as-

sembly wall (100) of any one of the preceding claims and
a reinforced structure for supporting the assembly wall (100).

Patentansprüche

1. Montagewand (100) mit verbesserter Schallabsorptions-/Dämmleistung, mit:

Plattenelementen (110), die voneinander so getrennt sind, dass sie einander zugewandt sind, und jeweils wenigstens eine Schicht bilden, Ständerelementen (120), die abwechselnd auf verschiedenen Innenflächen der Plattenelemente (110) angeordnet sind und einen Steg (122) umfassen, der mit mehreren ersten Perforationslöchern (124a, 124b, 124c) gebildet ist, die wenigstens einen Durchmesser aufweisen, einem Dämmelement (130), das in einem zwischen den Plattenelementen (110) und den Ständerelementen (120) gebildeten Raum eingefügt ist, und einem Folienelement (140), das an eine Außenfläche des Dämmelements (130) angrenzt und mit mehreren zweiten Perforationslöchern (142) gebildet ist, die wenigstens einen Durchmesser aufweisen,

dadurch gekennzeichnet, dass die ersten Perforationslöcher (124a, 124b, 124c) des Steges (122) je nach einer Hauptschallabsorptionsfrequenz der Montagewand unterschiedliche Durchmesser aufweisen und einem Innenraum (R) zugewandt freiliegen, der von den Ständerelementen (120), den Plattenelementen (110) und dem Folienelement (140) gebildet ist.

2. Montagewand nach Anspruch 1, bei der die ersten Perforationslöcher (124a, 124b, 124c) und die zweiten Perforationslöcher (142) je nach einer ausgewählten Hauptschallabsorptionsfrequenz der Montagewand (100) verschiedene Durchmesser aufweisen.
3. Montagewand nach Anspruch 2, bei der die ersten Perforationslöcher (124a, 124b, 124c) und die zweiten Perforationslöcher (142) einen Durchmesser im Bereich von 0,1 mm bis 5 mm aufweisen.
4. Montagewand nach Anspruch 1, bei der die Plattenelemente (110) ein Material mit Schalldämm- und Brandschutzfunktion umfassen.
5. Montagewand nach Anspruch 4, bei der die Plattenelemente (110) ein Material umfassen, das aus Gipskartonplatten, Magnesiumoxidplatten (MgO-Platten), Keramikplatten, Zementplatten und Leichtbetonplatten ausgewählt ist.

6. Montagewand nach Anspruch 1, bei der das Dämmelement (130) ein Material mit Wärmedämm- und Schallabsorptionsfunktion umfasst.

7. Montagewand nach Anspruch 6, bei der das Dämmelement (130) eines der Folgenden umfasst: Steinwolle, Mineralwolle, Glaswolle, Keramikfasern, Polyethylenterephthalat-(PET)-Vliesfasern, Cellulosefasern und verschiedene Schäummaterialien.

8. Montagestruktur mit verbesserter Schallabsorptions-/Dämmleistung, mit der Montagewand (100) nach einem der vorhergehenden Ansprüche und einer verstärkten Struktur zum Tragen der Montagewand (100).

Revendications

1. Paroi de montage (100) présentant une performance d'absorption acoustique/d'isolation améliorée, comportant :

des éléments de plaque (110) séparés les uns des autres de manière à se faire face et formant chacun au moins une couche,

des éléments de montant (120) qui sont agencés en alternance sur différentes faces intérieures des éléments de plaque (110) et comportent une barrette (122) qui est réalisée avec plusieurs premiers trous de perforation (124a, 124b, 124c) qui présentent au moins un diamètre,

un élément isolant (130) interposé dans un espace défini entre les éléments de plaque (110) et les éléments de montant (120), et

un élément de feuille (140) qui est adjacent à une face extérieure de l'élément isolant (130) et est réalisé avec plusieurs deuxièmes trous de perforation (142) qui présentent au moins un diamètre,

caractérisée en ce que les premiers trous de perforation (124a, 124b, 124c) de la barrette (122) présentent différents diamètres en fonction d'une fréquence d'absorption acoustique principale de la paroi de montage et sont exposés vers un espace intérieur (R) qui est défini par les éléments de montant (120), les éléments de plaque (110) et l'élément de feuille (140).

2. Paroi de montage selon la revendication 1, dans laquelle les premiers trous de perforation (124a, 124b, 124c) et les deuxièmes trous de perforation (142) présentent différents diamètres en fonction d'une fréquence d'absorption acoustique principale choisie de la paroi de montage (100).

3. Paroi de montage selon la revendication 2, dans la-

quelle les premiers trous de perforation (124a, 124b, 124c) et les deuxièmes trous de perforation (142) présentent un diamètre compris entre 0,1 mm et 5 mm.

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4. Paroi de montage selon la revendication 1, dans laquelle les éléments de plaque (110) comportent une matière à fonctions d'isolation acoustique et de coupe-feu.

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5. Paroi de montage selon la revendication 4, dans laquelle les éléments de plaque (110) comportent une matière choisie parmi les plaques de plâtre, les plaques en oxyde de magnésium (MgO), les plaques céramiques, les plaques de ciment et les panneaux de béton léger.

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6. Paroi de montage selon la revendication 1, dans laquelle l'élément isolant (130) comprend une matière qui présente des fonctions d'isolation thermique et d'absorption acoustique.

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7. Paroi de montage selon la revendication 6, dans laquelle l'élément isolant (130) comporte de la laine de roche, de la laine minérale, de la laine de verre, des fibres céramiques, des fibres non-tissées de polytéréphtalate d'éthylène (PET), des fibres de cellulose ou différentes matières moussantes.

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8. Structure de montage présentant une performance d'absorption acoustique/d'isolation améliorée, comportant la paroi de montage (100) selon l'une des revendications précédentes, et une structure renforcée pour supporter la paroi de montage (100).

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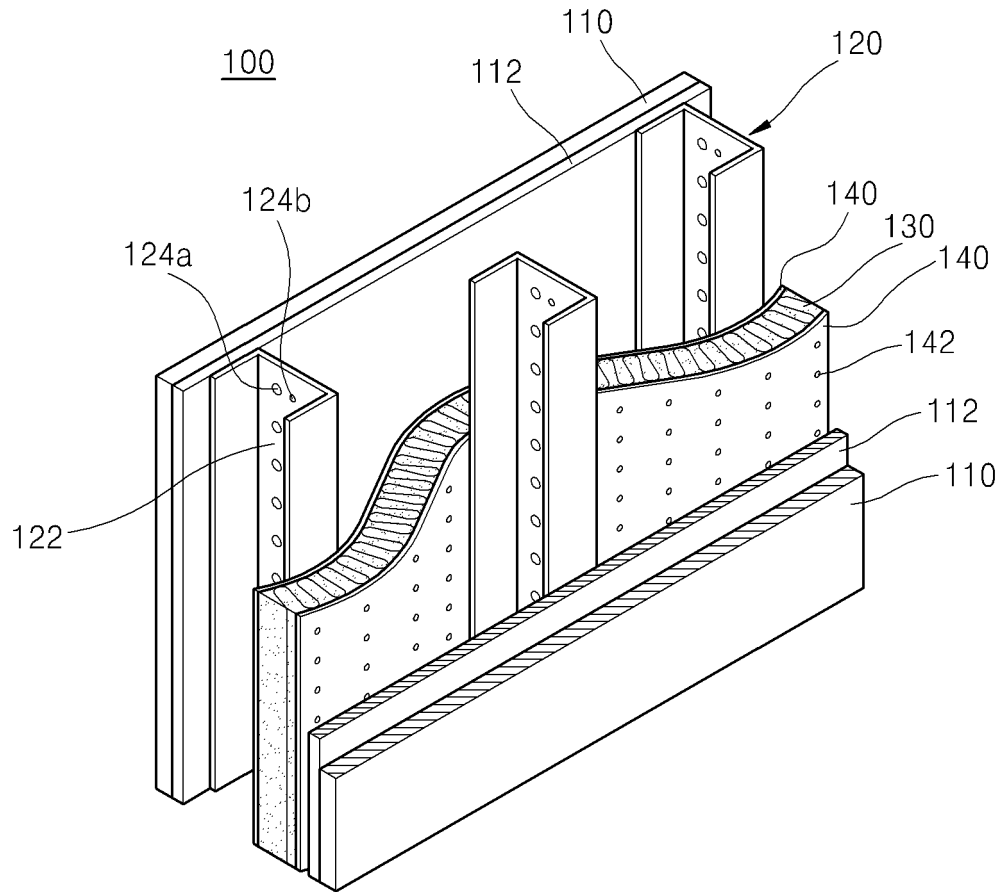
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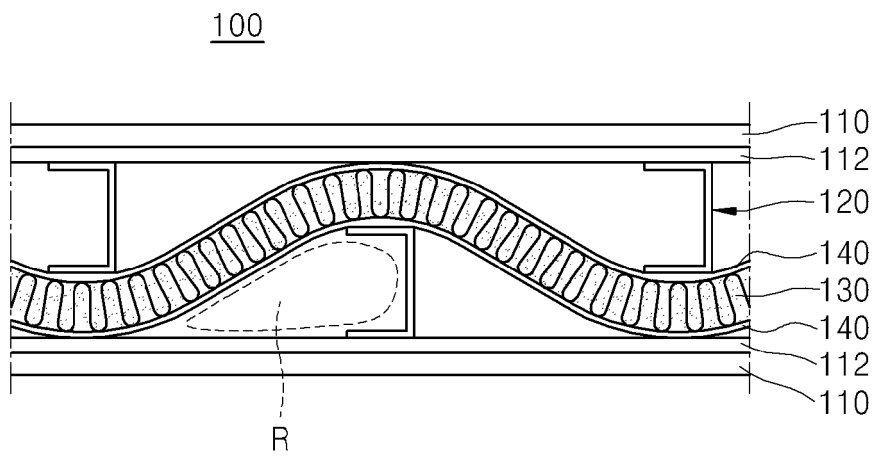
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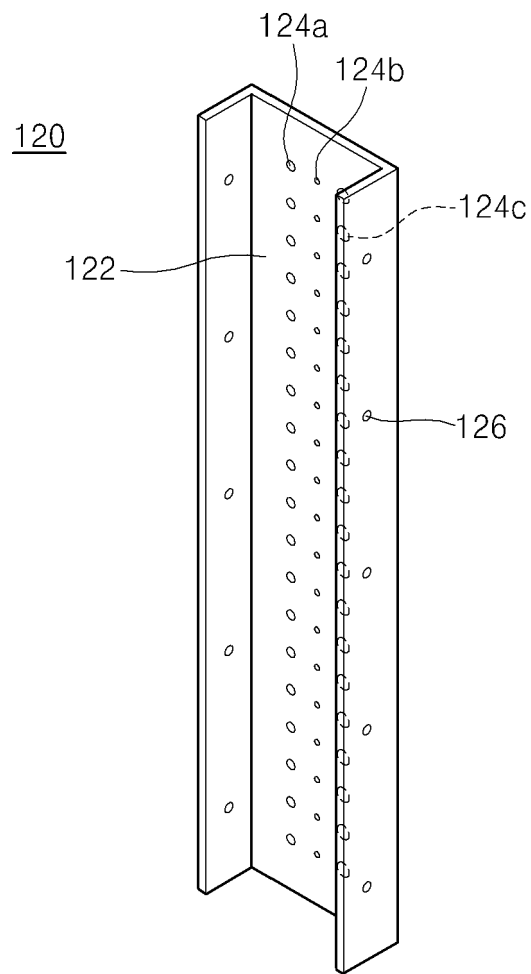
【FIG.1】



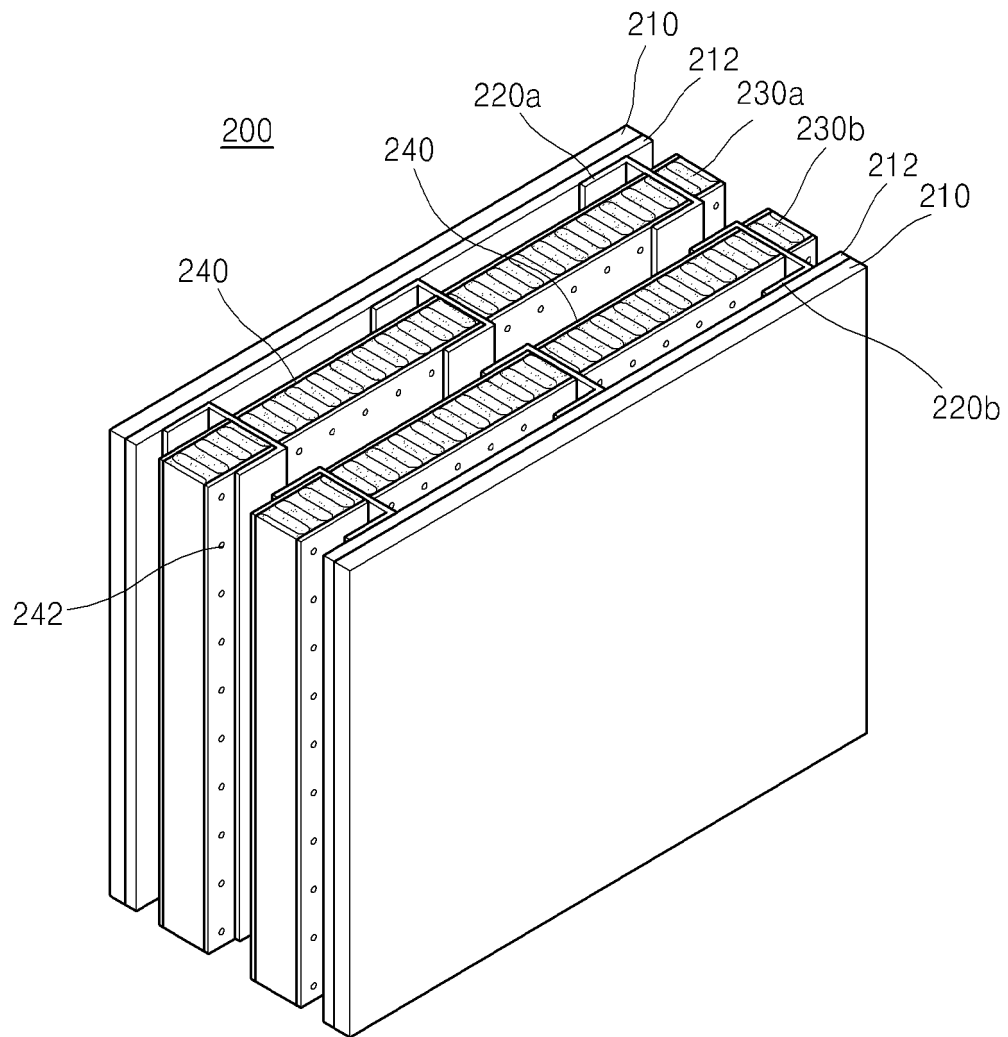
【FIG.2】



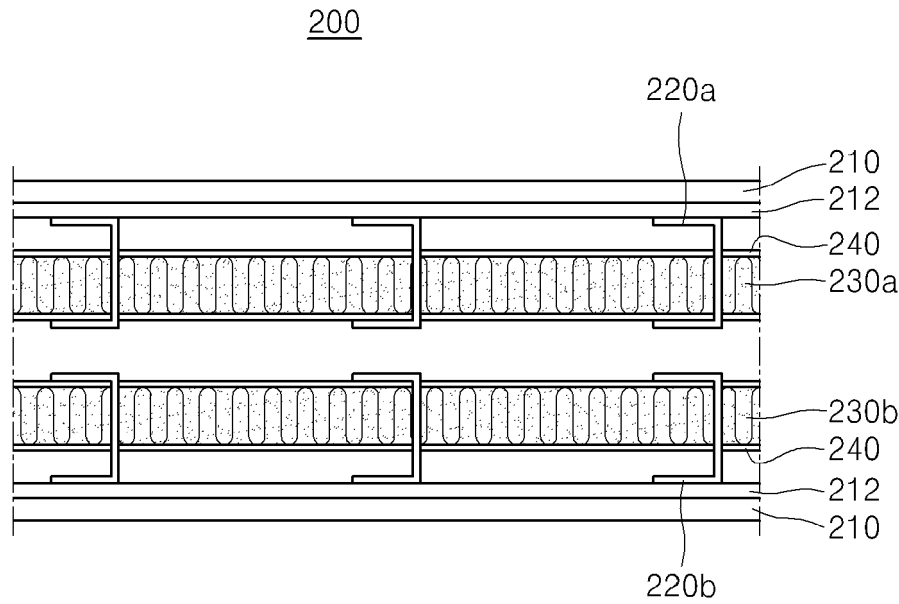
【FIG.3】



【FIG.4】



【FIG.5】



REFERENCES CITED IN THE DESCRIPTION

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